Quality Management in rainfall observation

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JMA/WMO Workshop on Quality Management of Surface Observations

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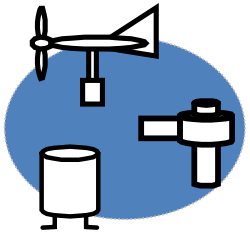
- JMA's quality management in rainfall observation
- Each country's quality management activity
- Introduction of useful HQC tools
- Summary of the session

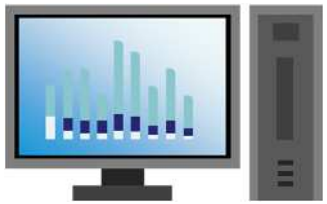
JMA'S QUALITY MANAGEMENT IN RAINFALL OBSERVATION

2 aspects of “Quality Management”

- A: Activities for the assurance of the observation
  - Instrument, Environment



- B: Activities for checking observation validity
  - Quality control



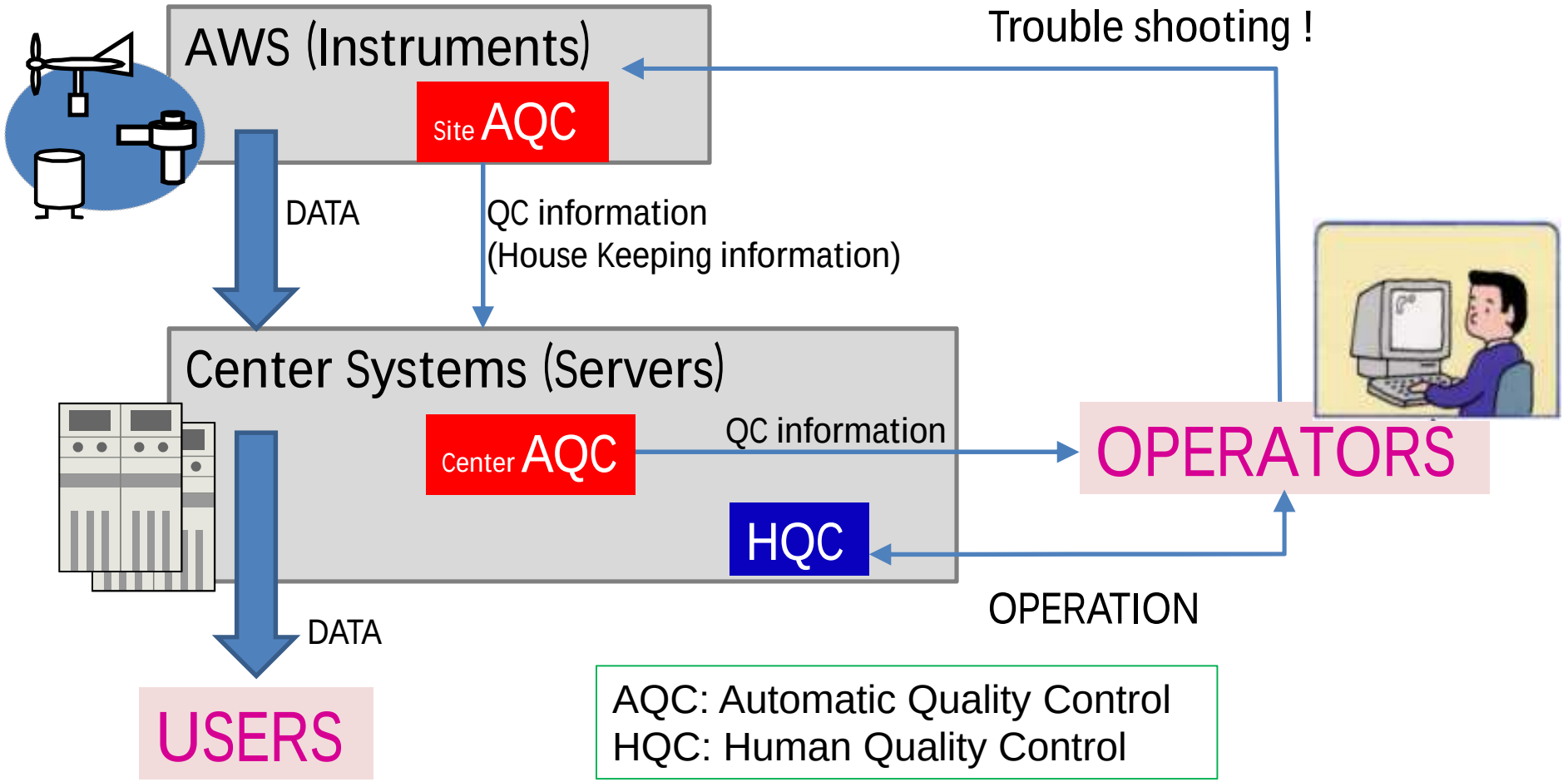
JMA's quality management in rainfall observation
A: Activities for the assurance of the observation

- Site inspection for AMeDAS (JMA's AWS)
  - Full inspection once a year
    - Mechanical check for the movable part of the rain gauge
    - Electric check for the signal processor and the electric terminal
    - Cleaning and protection of each parts
    - Environmental check
  - Non-regular site visit when necessary
    - Including immediate inspection in case of trouble

- Rain gauge overhaul in Meteorological Instrument Center every 5 years.

JMA's quality management in rainfall observation
B: Activities for checking observation data validity

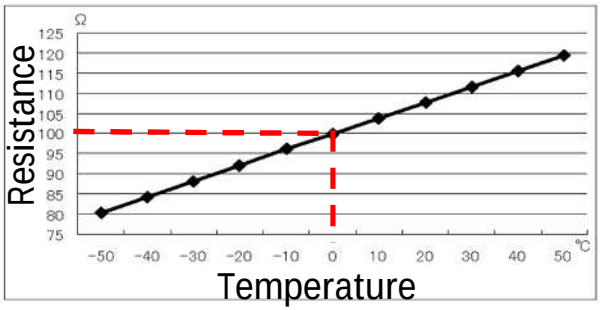
Operational diagram of QC in AMeDAS



JMA's quality management in rainfall observation
B: Activities for checking observation data validity

Site AQC for AMeDAS

- Self-Diagnosis check
  - Check of A/D converter functionality using reference signal



- HK (House keeping) check
  - Check of the status of each function in the instruments

Fan	Heater	CPU	BATT	COM
ON	OFF	OK	OK	OK

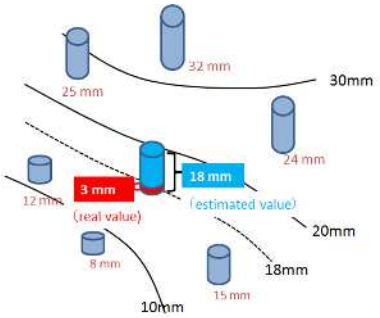
- Raw Data AQC
  - Limit value check: within the measurable range of the sensor

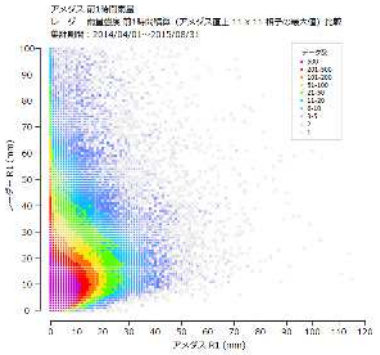
These checks are automatically and continuously run by instruments and its processor within the site.

JMA's quality management in rainfall observation
B: Activities for checking observation data validity

Center AQC for AMeDAS and other organization's data

- Limit value check
  - Check whether the data is improbable compared with the archived max value.
- Neighboring stations AQC
  - Check the difference between rainfall data and estimated value calculated from neighboring stations.
- Radar comparison AQC
  - Check the validity of rain gauge data by comparing with Radar data.



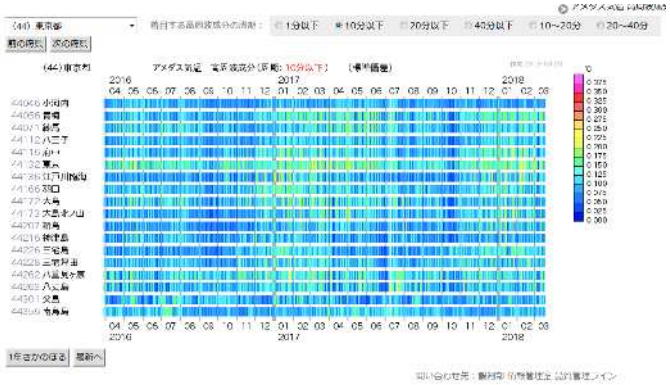


These checks are automatically and continuously run in the data center.

JMA's quality management in rainfall observation
B: Activities for checking observation data validity

HQC for AMeDAS and other organization's data

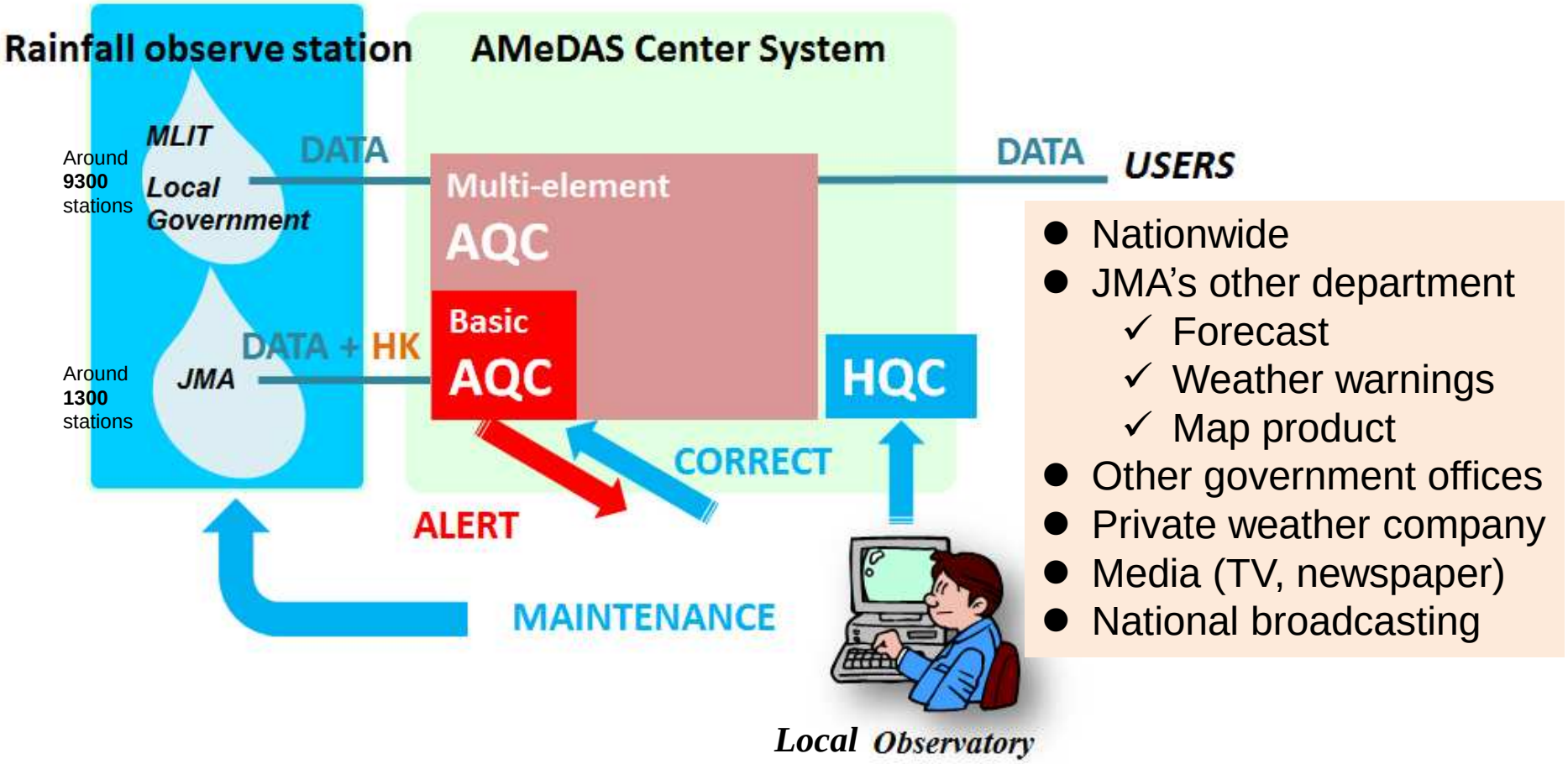
- Double mass analysis for precipitation data
- Wind rose analysis for wind data
- A year's plotting of sunshine duration
- … and so on, various tools are ready on the JMA internal web.



These checks are manually conducted by local observatory staffs when suspicious observation data are detected.

Quality managed rainfall observation

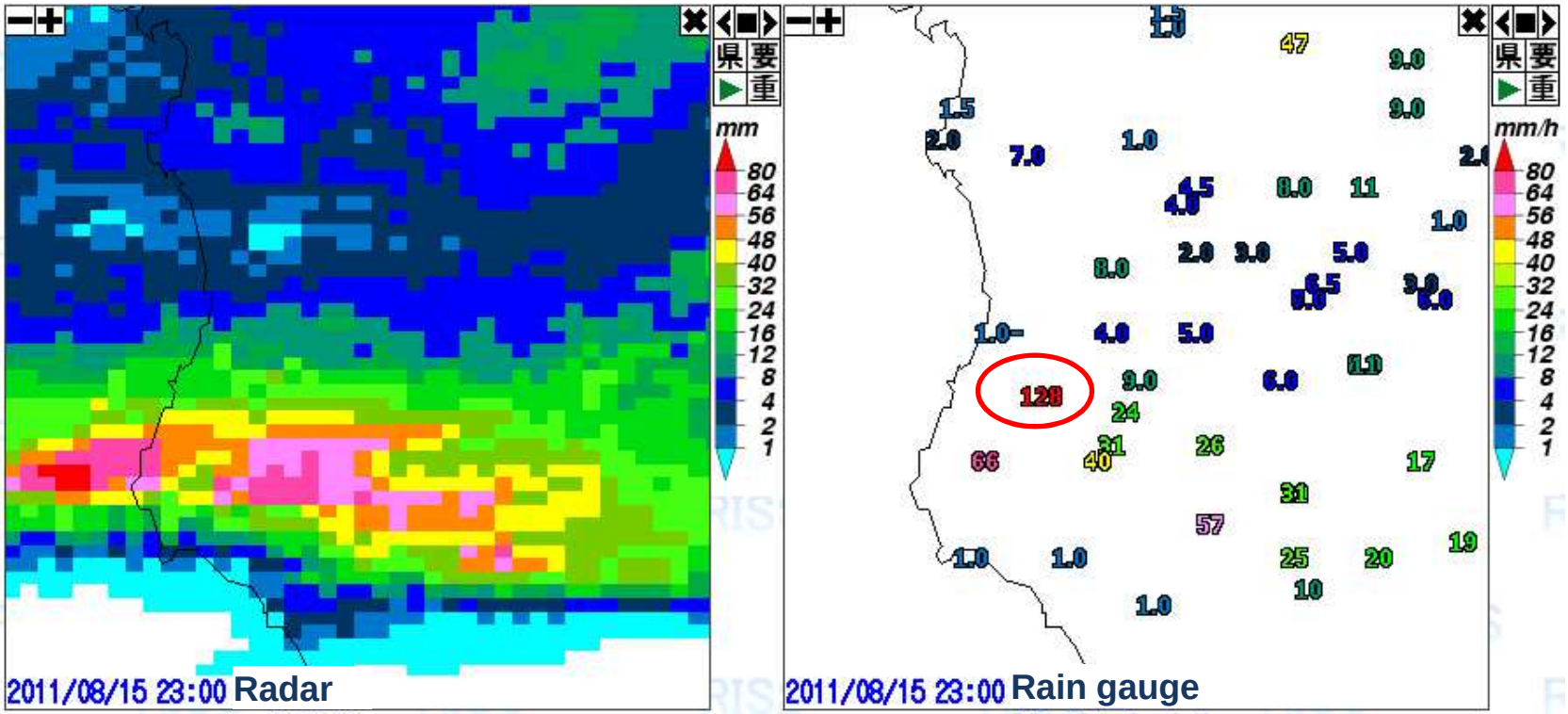
- fundamental of all the products for disaster prevention



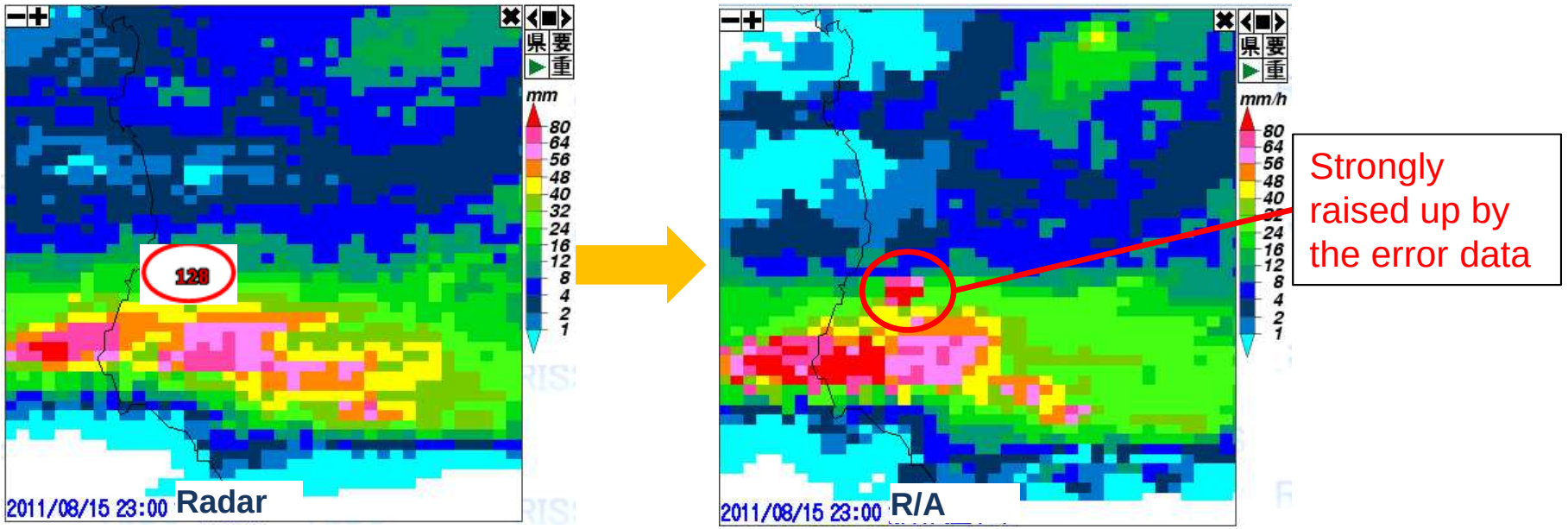
- Nationwide
- JMA's other department
  - ✓ Forecast
  - ✓ Weather warnings
  - ✓ Map product
- Other government offices
- Private weather company
- Media (TV, newspaper)
- National broadcasting

Bad influence of error observation(1)

- 23:00(JST;UTC+9), 15 Aug. 2011, southern part of Japan
- 128mm/1hour was observed and the local observatory issued an information of torrential rain but actually no such rainfall occurred.
- 128mm/1hour was an error observation caused by lightening- triggered CPU halt.



Bad influence of error observation(2)



- The error data caused the wrong result in “Radar/Rain gauge analyzed precipitation” product.
- Information of torrential rain was issued based on these results.
- Once an incorrect Disaster Risk Reduction information is issued, bad influences of the information spreads vastly.

Bad influence of error observation(3)

- To prevent the bad influence of error observations, quality management activities for the assurance of the observation and checking the observation data validity are quite important.
- The observations are located at the most upstream of all of our information. Therefore we should know the extent of influences caused by error observations.

EACH COUNTRY'S QUALITY MANAGEMENT ACTIVITY

Question

- From the quality management activities listed below, please select the top 3 activities which you think are important. Also please briefly explain why those activities are important.
- List of quality management activities
  - A. Regular basis and planned maintenance and calibration for the rain gauge
  - B. Keeping a good environment for observation
  - C. Proper management of the observation meta data
  - D. Monitoring the HK information
  - E. AQC
  - F. HQC
  - H. Training for observation and maintenance of the instrument

Answer

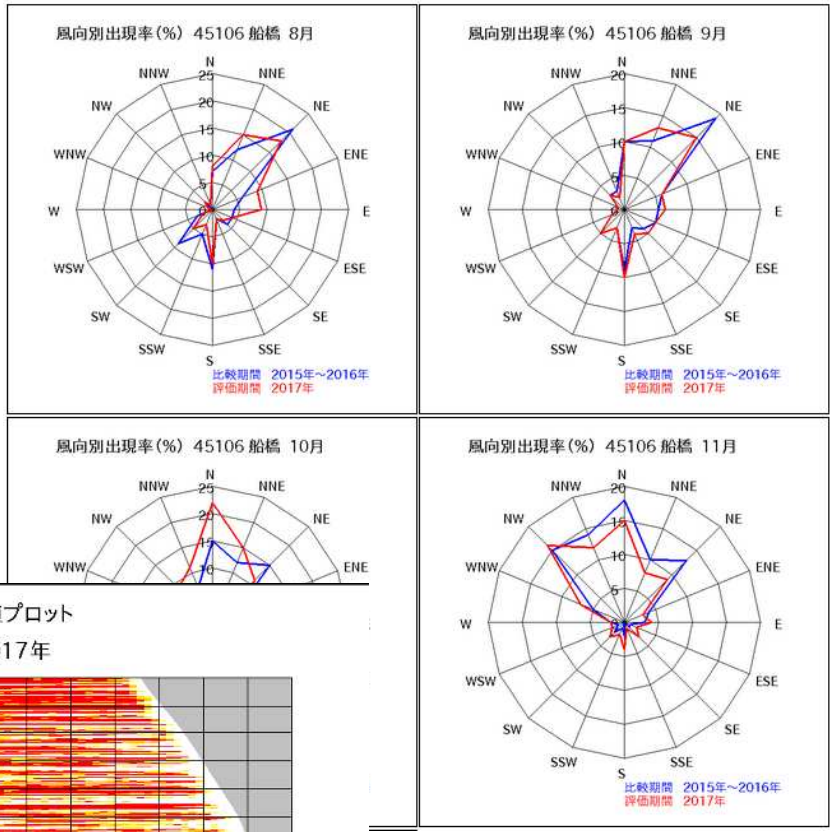
	Important activities	Reasons
Bangladesh	A,F,E	Accurate data depends on the perfect Instruments.
Cambodia	B,D,H	Basis data sent from AWS to the center system.
Lao PDR	A,F,H	Precipitation is the base, influencing to DRR.
Maldives	A,F,H	Quality control of error data.
Myanmar	A,F,H	-
Pakistan	H,E,F	The role of observor is very vital. Quality of rain gauge is important.
Sri Lanka	B,H,A	Before select a collaborating agency's site, we should search environment.
Thailand	D,F,B	It is first step for checking and QC.
UAE	A,F,H	To avoid/reduce the error , we have to make regular maintenance and calibration of the rain gauges.
Viet Nam	H,C,E	Lack of experience staff in maintenance of instrument.

INTRODUCTION OF USEFUL HQC TOOLS

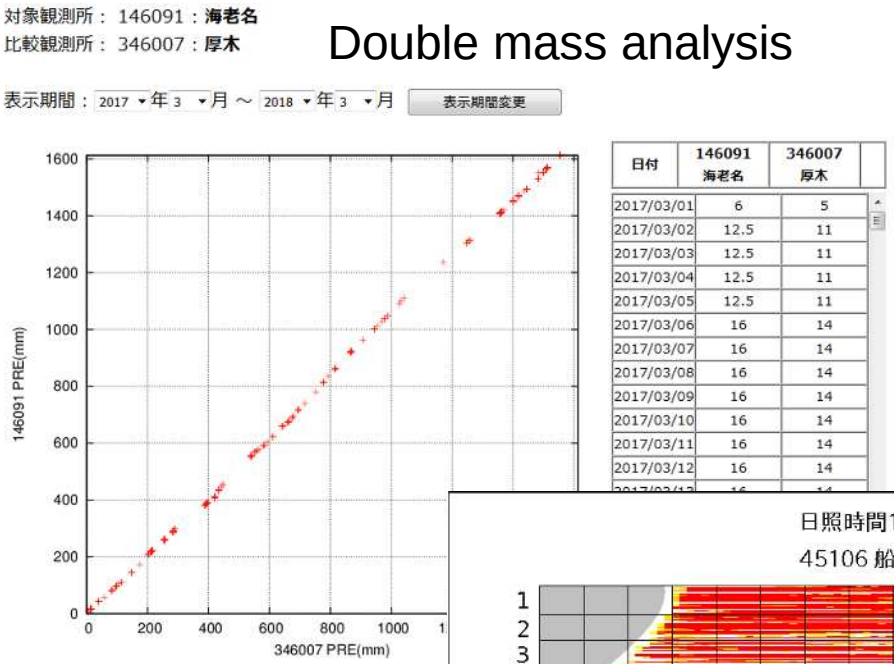
JMA's HQC tools

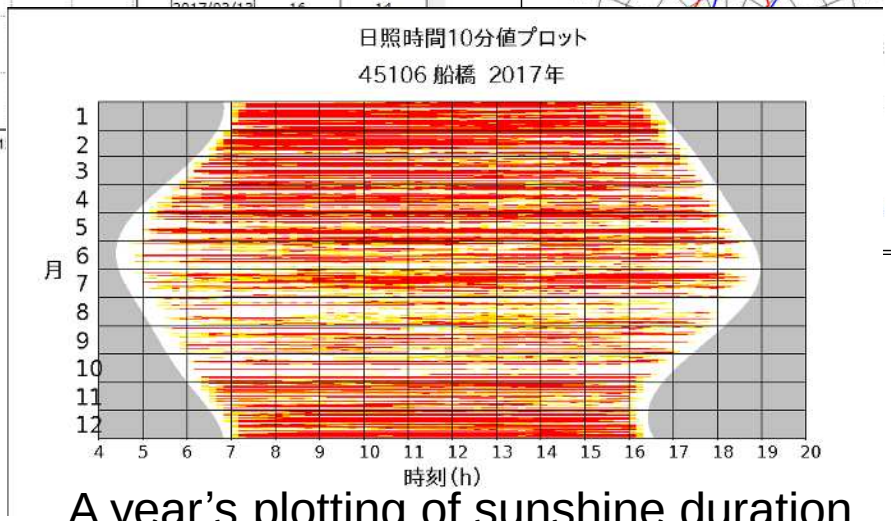
- Web based HQC tools

Wind rose



Double mass analysis





A year's plotting of sunshine duration

HQC role of local observatory

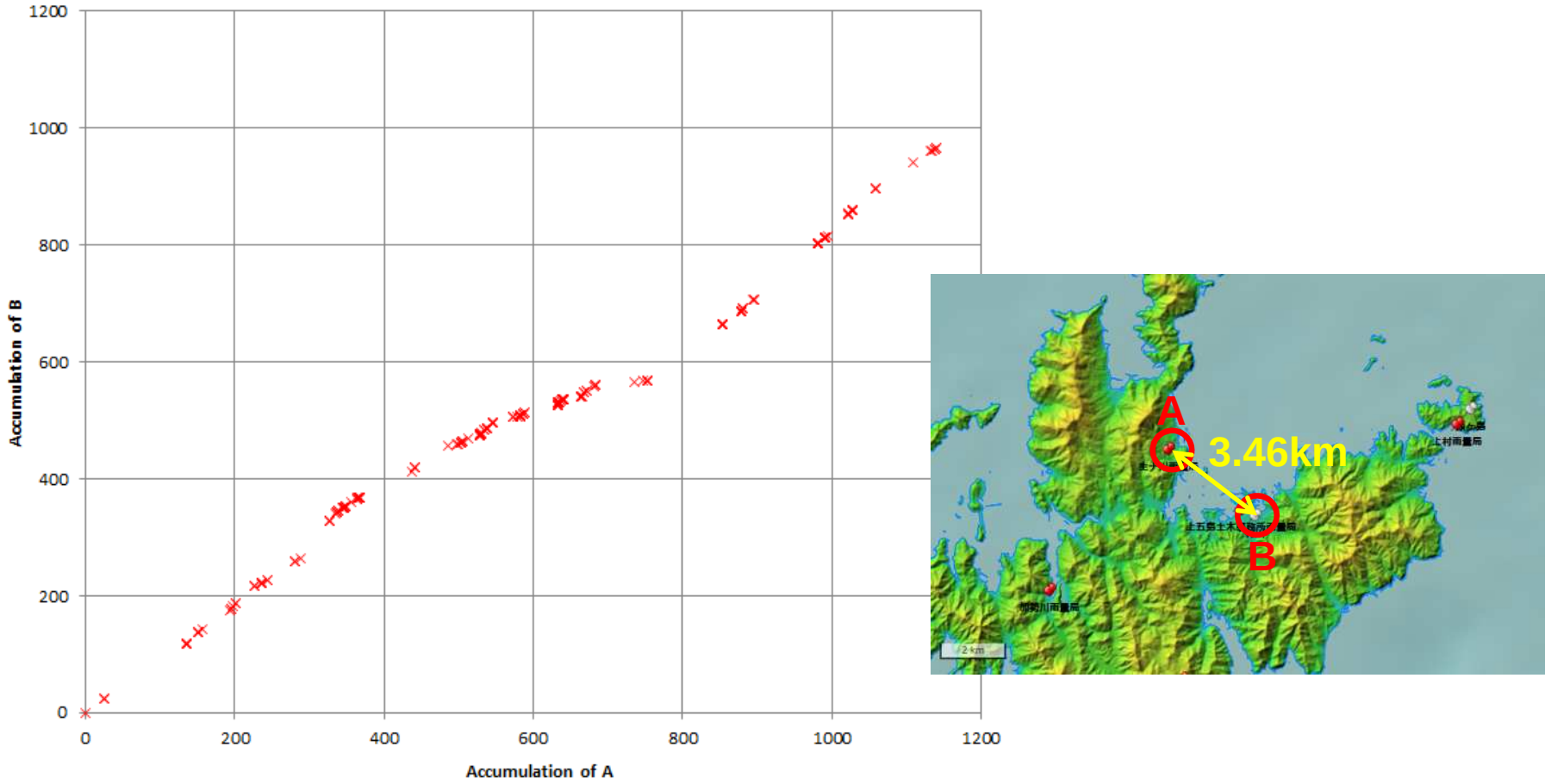
- The web interface and all the archived data enable all JMA staffs to conduct HQC activity.
- To consider the results of HQC tools, the background information of the site is very important.
- Therefore the local observatory staffs are suited for the HQC activity.

Introduction of double mass tool

- “Double mass analysis” is easy to conduct.
- Double mass analysis is very useful when 2 stations are near enough and one of them degrades slowly through a long period.
- An exercise tool of double mass analysis is ready in the provided Excel file.
  - Let’s perform an Excel exercise together if Excel is available in your PC.
  - If Excel is unavailable, please look carefully at the front screen.

What happened to site A/B? (1)

- Please focus on the change point of the regression line's gradient.



What happened to site A/B? (2)

At this date, a site maintenance work for improving the ground condition was done. We concluded that the dust which hovered from the ground might have contaminated the rain gauge and friction increased at the bearing of the tipping bucket.

At this date, we found that the rain gauge B had trouble.

Actually, the degradation started around this point.

6 weeks

We replaced the rain gauge B with a reserved one on this date.

During this period, a change in the regression line's gradient means that ***site B' s precipitation became smaller in comparison with site A***.

400 600 800 1000

Accumulation of A

Application for your work

- You can easily perform a double mass analysis by Excel not only for the rainfall observations but also for various analyses such as a comparison of sunshine durations.
- JMA has many HQC techniques and we can support you for applying them to your operation.
- If you can provide the archived data which needs HQC to us, we can also help you with those data.
- JMA can provide some HQC tools such as Excel macro for the first step.

SUMMARY OF SESSION

Summary of session

- We confirmed that the quality managed observation is the foundation for all the Disaster Risk Reduction activities.
- We roughly grasped which activities are important for each country's meteorological services.
- As an example of a useful HQC tool, we actually exercised a double mass analysis on the Excel worksheet.

Thank you for your attention.